REMARKS

This Amendment is being filed in response to the Office Action dated December 12, 2003. For the following reasons, this Application should be allowed, and the case passed to issue.

Claims 1-13 are pending. Claims 1, 6, 10, and 11 are currently amended.

No new matter is introduced by this amendment. The amendment to claim 1 is supported by Figures 1 and 14 and the accompanying portions of the specification. The amendments to claims 6, 10, and 11 merely correct informalities and do not narrow the scope of these claims.

Claim Objection

Claim 10 is objected to because "said fourth regions" lacks antecedent basis. In response to this objection, claim 10 has been amended to provide antecedent basis for "said fourth regions."

Claim Rejections Under 35 U.S.C. § 112

Claims 4 and 9 are rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which is not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. The Examiner asserts that the specification does not disclose the advantage of having the fourth region electrically connected to the first or second electrode portion. This rejection is traversed, and reconsideration and withdrawal thereof, respectfully requested.

not OK
how about the 1st electrode

Contrary to the Examiner's assertion, the specification explicitly teaches the advantage of fixing the fourth region (P-type diffusion region 7) to a constant potential (source electrode 9) in the fourth embodiment (page 16, line 28 to page 17, line 22).

Claims 2, 5, 6, 10, and 11 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner asserts that it is unclear how a fifth region of the first conductivity surrounding the third electrode portion is formed at and near the surface of the first region, as in claim 2, when claim 1 requires that the third electrode portion is connected to a first region of a second conductivity type. As regards claim 5, the Examiner avers it is unclear how the position in depth of an interface between the first region and the fourth region changes in a direction crossing a direction of flow of current. The Examiner further asserts that it is unclear how the plurality of fourth regions have a depth changing as a position moves in a direction crossing a direction of flow of the current, as in claim 10. This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

Claims 2, 5, 10 are clear and definite. The ninth embodiment of the instant invention (page 22, lines 27-33 and FIG. 30) teach the fifth region of the first conductivity type surrounding the third electrode portion and formed at and near the surface of the first region, as required by claim 2. As regards claims 5 and 10, the specification (page 10, lines 1-12) explains how a position in depth of an interface between the first region and the fourth region changes in a direction crossing a direction of flow of the current.

Claim Rejections Under 35 U.S.C. § 103

Claims 1, 3, and 4 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kitamura et al. (US Patent No. 5,432,370). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the instant invention, as claimed, and the cited prior art.

An aspect of the invention, per claim 1, is a semiconductor device with a first region of a second conductivity type formed on and in direct contact with a semiconductor substrate of a

first conductivity type. The semiconductor device further comprises a fourth region of the first conductivity type formed at and near the surface of the first region between a third electrode and a third region of the first conductivity type. (An interface between the first region and the fourth region in a depth direction changes for any cross sections crossing a region in which the interface exists along a direction of flow of the current.) In addition, the position of the interface in the depth direction also changes for any cross sections crossing the region along a direction substantially orthogonal to the direction of the current flow.

The Examiner avers that Kitamura substantially teaches the claimed semiconductor device and that it would have been obvious to have a fourth region with a depth changing as the position moves in a direction crossing a direction of flow of the current because the impurity diffusion method of forming semiconductor regions is well known and it produces curved pn junctions. In addition, the Examiner considers claim 3 inherent because the fourth region 4 of Kitamura is fixed to the source electrode 12a that is always connected to a constant source potential. As regards claim 4, the Examiner asserts that Kitamura discloses the fourth region 4 is electrically connected to the second electrode portion 12a.

Kitamura does not suggest the claimed semiconductor device. In Kitamura region 4 is formed over most of the region between the source and drain to ensure a high withstand voltage due to a JFET effect. In addition, an opening 36 is formed in region 4 above region 2 to substantially increase a cross section of region 2 to decrease the on resistance (column 11, lines 3-6).

not OK

As shown in Figs 6(a) and 6(b), the Kitamura semiconductor device includes a portion in which a position of an interface between region 4 (the fourth region) and region 2 (the first

region) in depth direction is constant and does not change for a direction crossing a direction of the current flow on upstream and downstream sides of the current flow for opening 36, as shown on attached sheet A (see the cross section Y'-Y').

how about Y-Y

In contrast to the Kitamura device, the present invention does not ensure a high withstand voltage due to a JFET effect. The interface between first region 2 and fourth region 7 exists in the cross-hatched regions show in marked up Fig. 1 of attached sheet B and marked up Fig. 14 of attached sheet C. Fourth region 7 only contributes to reduce the electric field in a portion in which it is located.

In the region in which the interface between first region 2 and fourth region 7 exists, a position of the interface in a depth direction changes for any cross sections crossing the region along a direction of the current flow (thick arrow). In addition, the position of the interface in the depth direction also changes for any cross sections crossing the region along a direction substantially orthogonal to the direction of the current flow (thin arrow).

It is noted that, if region 4 (fourth region) and region 2 (first region) as shown in the Y'-Y' cross section of Kitamura are formed in the present invention, the structure will be similar to that shown in Prior Art Fig. 31, and the resistance will increase. Such a structure would not provide the benefits of the present invention and would not read on the instant claims.

Allowable Subject Matter

Claim 2 would be allowable if rewritten to overcome the rejection under 35 U.S.C. § 112 and in independent form.

Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

Claims 7, 8, and 13 are allowed.

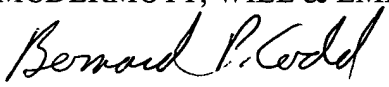
Applicant gratefully acknowledges the indication of allowable subject matter. Applicant submits that it is not necessary to place claims 2 and 12 in independent form, as claim 1 is allowable as explained above.

In light of the amendment and remarks above, this application is in condition for allowance and the case should be passed to issue. If there are any question regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY



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